

SUBJECT INDEX

A

- Acetate
aflatoxin biosynthesis and,
336-37
- Acquired resistance
systemic
rhizosphere
bacteria-induced, 453-78
- Acroboloides buetschlii*
sustainable systems for
nematode management
and, 183
- Actinomycin D
systemic resistance induced by
rhizosphere bacteria and,
461
- Active defense mechanisms
bacterial proteins as primary
elicitors of active defense
responses, 63-68
cumulative features, 71-75
fungal proteins as primary
elicitors of active defense
responses, 68-70
future research, 79-80
introduction, 59-61
molecular recognition events
eliciting primary defense
responses, 61-76
nematode elicitor detection by
plant cells, 70-71
protein-elicited plant responses,
76-79
viral proteins as primary
elicitors of active defense
responses, 61-63
- N-Acyl-homoserine lactones*
gene regulation in plant-
associated bacteria and
Agrobacterium tumefaciens,
211-13
community ecology, 219-20
Erwinia carotovora, 213-15
Erwinia stewartii, 215
identification of
AHL-producing bacteria,
211
introduction, 207-8
overview, 208-11
plant-bacterial interactions,
218-19
Pseudomonas aureofaciens,
216-17
Ralstonia solanacearum, 215
Rhizobium leguminarosum,
215-16
signaling, 211-19
- Adenylate
aflatoxin biosynthesis and,
346-48
- Advisory programs
sustainable systems for
nematode management
and, 195-96
- Aedes aegyptii*
Tenuiviruses and, 158
- AEP proteins
N-acyl-homoserine lactones n
plant-associated bacteria
and, 214
- Aflatoxins
biosynthesis of
acetate to hexanoic acid,
336-37
adenylate concentration and
energy charge, 346-48
averantin to 5'
hydroxyaverantin, 339
carbon utilization, 343-46
DHOMST to AFB2, 341
DHST to DHOMST, 341
DMDHST to DHST, 340-41
DMST to sterigmatocystin,
340
future directions, 353-55
genetic analysis, 332-33
hexonyl CoA to noranthrone,
337
introduction, 329-32
linkage of secondary
metabolism and
development, 343-44
molecular analysis of
pathway, 333-36
nitrogen utilization, 349-51
noranthrone to norsolorinic
acid, 337-38
norsolorinic acid to
averantin, 338-39
OMST to AFB1, 341
pathway-specific regulation,
341-43
pH effects, 351-53
physiological determinants,
345-55
redox, 348-49
regulation, 341-45
sterigmatocystin to OMST,
341
versicolorin A to DMST,
340
versicolorin B to DHDMST,
340
versicolorin B to versicolorin
A, 339-40
versiconal to versicolorin B,
339
- AFLP technique
root-knot nematode resistance
genes in tomato and, 286
- Africa
recombination in *Magnaporthe*
grisea and, 262, 264
Xanthomonad diversity and, 46
- Agricultural consultants
holistic plant health and, 15-16
- Agrobacterium radiobacter*
sustainable systems for
nematode management
and, 189
- Agrobacterium* spp.
active defense mechanisms and,
67
- Agrobacterium tumefaciens*
N-acyl-homoserine lactones in
plant-associated bacteria
and, 211-13
- Agroecosystem paradigm
holistic plant health and, 8-9
- Alfalfa
root border cells and, 313,
316-17
- Allodorylaimus americanus*
sustainable systems for
nematode management
and, 179
- Alpha box
Cochliobolus MAT gene and,
119-20
- Alternaria* spp.
Cochliobolus MAT gene and,
115, 132
- Ambisense RNA
Tenuiviruses and, 139, 149, 151,
155-56
- Amino acids
active defense mechanisms and,
63, 68
N-acyl-homoserine lactones in
plant-associated bacteria
and, 211
Cochliobolus MAT gene and,
122, 125, 127
papaya ringspot virus and, 422

- root-knot nematode resistance genes in tomato and, 277, 282-85
 satellite tobacco mosaic virus and, 301, 306
Tenuiviruses and, 148
 Amylolytic activity
 Xanthomonad diversity and, 41-43, 47-48, 52
Andropogon spp.
 sustainable systems for nematode management and, 186
 Animals
 programmed cell death in plant disease and, 393-410
 type III protein secretion systems and, 363-83
 Antagonists
 bacterial
 fire blight management and, 236-45
 fungal
 biocontrol of root-rot and, 439-50
 Antibiotics
 N-acyl-homoserine lactones in plant-associated bacteria and, 213-14
 root cortical fungi and, 439-50
 systemic resistance induced by rhizosphere bacteria and, 461
 Antibiotic spray programs
 fire blight management and, 227, 231-32, 237, 241, 243-44
 Ants
 Tenuiviruses and, 143
Aphelenchoides spp.
 sustainable systems for nematode management and, 182, 192
Aphelenchus avenae
 sustainable systems for nematode management and, 182
 Aphids
 papaya ringspot virus and, 419
 root-knot nematode resistance genes in tomato and, 277, 282-83
 Apoptosis
 plant disease and, 393-410
 Apple
 fire blight management and, 227-45
Arabidopsis spp.
 active defense mechanisms and, 65, 70, 74, 76, 78
 systemic resistance induced by rhizosphere bacteria and, 453, 472-76
Arabidopsis thaliana
 root border cells and, 313
Arachis hypogaea
 sustainable systems for nematode management and, 173
 Arbitrarily-primed PCR
 sustainable systems for nematode management and, 175
Arenaviridae
 Tenuiviruses and, 151
 Argentina
 sustainable systems for nematode management and, 167
 Arkansas
 recombination in *Magnaporthe grisea* and, 266
 reduced tillage effect on soilborne plant pathogens and, 486
 sustainable systems for nematode management and, 190
Arthrobacter spp.
 fire blight management and, 231
 Ascomycetes
 Cochliobolus MAT gene and, 115-34
 recombination in *Magnaporthe grisea* and, 249-70
 Asexual fungi
 Cochliobolus MAT gene and, 122, 124-26
ASH1 gene
 Cochliobolus MAT gene and, 120
 Asia
 holistic plant health and, 6
 recombination in *Magnaporthe grisea* and, 249-70
 sustainable systems for nematode management and, 197
 Asia Minor
 cypress canker and, 95
Aspergillus flavus
 aflatoxin biosynthesis and, 329-56
Aspergillus nidulans
 aflatoxin biosynthesis and, 329-56
Aspergillus parasiticus
 aflatoxin biosynthesis and, 329-56
Aspergillus spp.
 Cochliobolus MAT gene and, 125
 Atlantic Ocean
 cypress canker and, 95
 Australia
 cypress canker and, 100
 papaya ringspot virus and, 418, 432
 root cortical fungi and, 439, 441-42, 445
 sustainable systems for nematode management and, 167, 197
 Xanthomonad diversity and, 46
 Autoinduction
 N-acyl-homoserine lactones in plant-associated bacteria and, 207-21
Avena sativa
 holistic plant health and, 6-7
Avena sterilis
 holistic plant health and, 6-7
 Avertin
 aflatoxin biosynthesis and, 338-39
 Avirulence genes
 active defense mechanisms and, 59, 63-77
 root-knot nematode resistance genes in tomato and, 277-89
 Xanthomonad diversity and, 43-45
 Avoidance
 sustainable systems for nematode management and, 165
avr genes
 active defense mechanisms and, 59, 63-77
 Xanthomonad diversity and, 43-45
 Avr proteins
 type III protein secretion systems and, 376-77

B

- Bacillus cereus*
 sustainable systems for nematode management and, 179
Bacillus sphaericus
 sustainable systems for nematode management and, 189
Bacillus spp.
 fire blight management and, 231
 sustainable systems for nematode management and, 180

- Bacillus subtilis*
sustainable systems for
nematode management
and, 180
- Bacillus thuringiensis*
sustainable systems for
nematode management
and, 181
- Bacteria
active defense mechanisms and,
60, 64-67, 70, 74, 76
Nacyl-homoserine lactones and,
207-21
fire blight management and,
227-45
root border cells and,
311-24
sustainable systems for
nematode management
and, 165, 174, 179-80,
183-84, 197
systemic resistance induced by
rhizosphere bacteria and,
453-78
type III protein secretion
systems and, 363-83
- Bacterial black spot
of pepper and tomato
Xanthomonad diversity and,
41, 43-54
- Bacterial proteins
active defense mechanisms and,
63-68
- Bacteriocins
Xanthomonad diversity and,
50-51
- Bacteriophages
Xanthomonad diversity and,
42, 50-51
- Bacterium exitiosa*
Xanthomonad diversity and,
42
- Bacterium vesicatorium*
Xanthomonad diversity and,
42
- Bacterivores
sustainable systems for
nematode management
and, 176
- Banana
sustainable systems for
nematode management
and, 193
- Barbados
Xanthomonad diversity and, 46,
48, 53
- Barley
active defense mechanisms and,
70
holistic plant health and, 6-8, 18
Tenuiviruses and, 153-54
- BARNASE gene
sustainable systems for
nematode management
and, 195
- Bean
sustainable systems for
nematode management
and, 168, 180
systemic resistance induced by
rhizosphere bacteria and,
453
- Belonolaimus gracillus*
sustainable systems for
nematode management
and, 186
- Belonolaimus longicaudatus*
sustainable systems for
nematode management
and, 186
- Bengal rice famine
Cochliobolus MAT gene and,
133
- Benomyl
sustainable systems for
nematode management
and, 173
- β -barrels
satellite tobacco mosaic virus
and, 300
- Bias
Cochliobolus MAT gene and,
123
satellite tobacco mosaic virus
and, 303
- Bioindicators of ecosystem health
sustainable systems for
nematode management
and, 182-83
- Biological control
fire blight management and,
227-45
reduced tillage effect on
soilborne plant pathogens
and, 494-95
sustainable systems for
nematode management
and, 165-98
- Biolog MicroPlates
Xanthomonad diversity and, 49
- Bipolaris sorokiniana*
reduced tillage effect on
soilborne plant pathogens
and, 491
- Bioremediation
root border cells and, 323
- Biotechnology
programmed cell death in plant
disease and, 408-9
- Bipolaris* spp.
Cochliobolus MAT gene and,
115
- Blast pathogens
recombination in *Magnaporthe*
grisea and, 249-70
- Blight
Cochliobolus MAT gene and,
133
cypress canker and, 91
- Blight Ban
fire blight management and, 227
- Blossom-blight phase suppression
fire blight management and,
227-29, 241-45
- Bond derivatives
holistic plant health and, 6
- Bootstrapping
Cochliobolus MAT gene and,
124
- Boraginaceae
history of research, 36
- Botryosphaeria* spp.
cypress canker and, 94
- Botryotinia fuckeliana*
Cochliobolus MAT gene and,
131
- Bradyrhizobium japonicum*
sustainable systems for
nematode management
and, 180, 184
- Brassica napus*
root cortical fungi and, 443
- Brassica* spp.
sustainable systems for
nematode management
and, 187
- Brazil
papaya ringspot virus and,
418-19, 432, 434
recombination in *Magnaporthe*
grisea and, 256, 259, 267
Xanthomonad diversity and, 46
- Browning JA, 1-22
- Brown spot of rice
Cochliobolus MAT gene and,
133
- Brush-out appearance
Tenuiviruses and, 142
- Bs* genes
Xanthomonad diversity and, 44
- Bunyaviridae*
Tenuiviruses and, 139-40, 149,
151, 156
- Bursaphelenchus xylophilus*
sustainable systems for
nematode management
and, 169, 197
- C
 Ca^{2+}
active defense mechanisms and,
77-79

- Caenorhabditis elegans*
sustainable systems for
nematode management
and, 182
- California
cypress canker and, 91, 95
recombination in *Magnaporthe*
grisea and, 266, 270
root-knot nematode resistance
genes in tomato and, 286
satellite tobacco mosaic virus
and, 295-309
Xanthomonad diversity and, 46
- Callus
cypress canker and, 105
- Cancer
apoptosis and, 398
cypress and, 91-111
- Candida albicans*
Cochliobolus MAT gene and,
126
- Canker
tomato, 41-54
- Cap-snatching
Tenuiviruses and, 139, 151, 153
- Capsicum annuum*
Xanthomonad diversity and, 43
- Capsicum rutescens*
Xanthomonad diversity and, 43
- Capsicum* spp.
Xanthomonad diversity and,
41-42, 44-54
- Carbapenems
N-acyl-homoserine lactones in
plant-associated bacteria
and, 213-14
- Carbohydrates
Xanthomonad diversity and, 49
- Carbon
afatoxin biosynthesis and,
345-46
Xanthomonad diversity and, 49
- car* genes
N-acyl-homoserine lactones in
plant-associated bacteria
and, 214
- Caribbean region
Xanthomonad diversity and, 46,
48, 51, 53
- Carnation
systemic resistance induced by
rhizosphere bacteria and,
453
- Carrot
sustainable systems for
nematode management
and, 172, 190
- Castor bean
sustainable systems for
nematode management
and, 180
- Cauliflower mosaic virus (CMV)
active defense mechanisms and,
77
- Cell cycle
programmed cell death in plant
disease and, 393-410
- Cell density-dependent regulation
N-acyl-homoserine lactones in
plant-associated bacteria
and, 207-21
- Cellular suicide
purposes for, 393-410
- Central America
recombination in *Magnaporthe*
grisea and, 265-67
Xanthomonad diversity and,
46, 51
- Centromere
root-knot nematode resistance
genes in tomato and, 281
- Cephalosporium gramineum*
reduced tillage effect on
soilborne plant pathogens
and, 489-90, 495
- Ceramide
programmed cell death in
plant disease and,
393-410
- Ceratocystis coerulescens*
Cochliobolus MAT gene and,
131
- Cf-9* resistance gene
active defense mechanisms and,
69, 70
- Chamaecyparis obtusa*
cypress canker and, 98
- Chamaecyparis* spp.
cypress canker and, 96-97
- Chamaecyparis thyoides*
cypress canker and, 98
- Chaperones
type III protein secretion
systems and, 372-73,
378, 380
- Chemicals
for disease control
reduced tillage effect on
soilborne plant pathogens
and, 493-94
- Chemotaxis
root border cells and,
319-20
- Chili pepper
Xanthomonad diversity and,
43
- Chimeras
active defense mechanisms and,
62
satellite tobacco mosaic virus
and, 306
Tenuiviruses and, 152-53
- China
recombination in *Magnaporthe*
grisea and, 256, 262-64,
267, 269
Tenuiviruses and, 143
- Chisel plows
reduced tillage effect on
soilborne plant pathogens
and, 486-87
- Chlamydomonas* spp.
Cochliobolus MAT gene and,
118
- Chloris gayana*
sustainable systems for
nematode management
and, 187
- Chromocrea spinulosa*
Cochliobolus MAT gene and,
131
- Chromosome length
polymorphisms
recombination in *Magnaporthe*
grisea and, 249, 258-59
- Chromosomes
Cochliobolus MAT gene and,
123
root-knot nematode resistance
genes in tomato and, 280,
287-88
- CIMMYT
holistic plant health and, 8
- cin* genes
N-acyl-homoserine lactones in
plant-associated bacteria
and, 216
- Circulative-propagative
transmission
Tenuiviruses and, 139, 144-45
- Circulifer tenellus*
history of research, 31
- cis*-aconitate
Xanthomonad diversity and, 49
- Cladistics
Cochliobolus MAT gene and,
132
- Cladosporidium fulvum*
active defense mechanisms and,
68-69, 72
- Clavibacter* spp.
fire blight management and,
231
- CLIMEX computer program
sustainable systems for
nematode management
and, 197
- Cloning
Cochliobolus MAT gene and,
121-22
root-knot nematode resistance
genes in tomato and,
277-89

- Clostridium butyricum*
sustainable systems for
nematode management
and, 188
- Coat proteins
active defense mechanisms and,
62, 74
- Coccidioides immitis*
Cochliobolus MAT gene and,
126
- Cochliobolus MAT* gene evolution
asexual fungi, 124-26
cloning strategies, 121-22
functional characterization,
119-21
genetic characterization,
116-17
heterothallic fungi, 128-30
homothallic fungi, 126-31
introduction, 115
mating-type mysteries, 131-32
phylogenetic characters, 123-24
plant pathogenesis origin,
132-34
rate, 122-23
structural characterization,
117-19
technological application,
129-34
- Codon bias
Cochliobolus MAT gene and,
123
- Coevolution
holistic plant health and, 7
- Collettrichum orbiculare*
sustainable systems for
nematode management
and, 189
- Colombia
holistic plant health and, 8
recombination in *Magnaporthe*
grisea and, 262, 266-67
- Colonization
root cortical fungi and, 446-47
- Community ecology
N-acyl-homoserine lactones in
plant-associated bacteria
and, 219-20
- Competition
root cortical fungi and, 439-50
- Conservation tillage
reduced tillage effect on
soilborne plant pathogens
and, 485-97
- Copy DNA (cDNA)
root-knot nematode resistance
genes in tomato and, 284
satellite tobacco mosaic virus
and, 303, 306-8
- Corn
N-acyl-homoserine lactones in
plant-associated bacteria
and, 215
Cochliobolus MAT gene and,
133
holistic plant health and, 5, 18
reduced tillage effect on
soilborne plant pathogens
and, 488
sustainable systems for
nematode management
and, 191
- Cortical cells
root cortical fungi and, 439-50
- Coryneum cardinale*
cypress canker and, 95
- Costa Rica
Xanthomonad diversity and, 41,
48, 52-53
- Cotton
root border cells and, 313, 320
sustainable systems for
nematode management
and, 170, 190
- COUGARBLIGHT system
fire blight management and, 234
- Cre3* gene
root-knot nematode resistance
genes in tomato and, 284
- Cricanemella* spp.
sustainable systems for
nematode management
and, 180
- Cropping systems
sustainable systems for
nematode management
and, 165-98
- Crop roots
destruction of
sustainable systems for
nematode management
and, 165, 174, 179
- Crop rotation
reduced tillage effect on
soilborne plant pathogens
and, 485-97
- Crops
Cochliobolus MAT gene and,
132
holistic plant health and, 1, 10,
18-21
root-knot nematode resistance
genes in tomato and,
277-89
Tenuiviruses and, 139-58
- Cross protection
papaya ringspot virus and,
415-34
- Crotalaria juncea*
sustainable systems for
nematode management
and, 180
- Crotalaria spectabilis*
sustainable systems for
nematode management
and, 186
- Crotalaria* spp.
sustainable systems for
nematode management
and, 186-88
- Crown rust
holistic plant health and, 5-7
- Crucema tipartitum*
sustainable systems for
nematode management
and, 182
- Cryphonectria parasitica*
Cochliobolus MAT gene and,
131-32
- Cryptic sex
Cochliobolus MAT gene and,
125
- Cryptomeria* spp.
cypress canker and, 96
- Cryptostictis* spp.
cypress canker and, 97
- Cucumber
root border cells and, 313
systemic resistance induced by
rhizosphere bacteria and,
453
- Cultural practices
reduced tillage effect on
soilborne plant pathogens
and, 495-97
sustainable systems for
nematode management
and, 165-98
- Cupressaceae
cypress canker and, 91
- Cupressocypariss* spp.
cypress canker and, 96-97
- Cupressus arizonica*
cypress canker and, 94
- Cupressus dupreziana*
cypress canker and, 93
- Cupressus lusitanica*
cypress canker and, 94, 97
- Cupressus macrocarpa*
cypress canker and, 91, 94
- Cupressus sempervirens*
cypress canker and, 91-94
- Curtobacterium* spp.
fire blight management and, 231
- Curvularia* spp.
Cochliobolus MAT gene and,
115
- Cyclopaldic acid
cypress canker and, 104-5
- Cynodon dactylon*
sustainable systems for
nematode management
and, 187

- Cypress canker
Cupressus sempervirens, 92-94
 cyclopaldic acid, 104-5
 differential responses of cypress tissue or callus to toxins, 105-7
 disease process, 100
 dissemination, 107-8
 epidemiology, 107-10
 fungi, 94-100, 102
 hosts, 92
 impact, 107-10
 introduction, 91-92
 Italian cypress, 92-94
Leptotypha cupressi, 96-98
 losses, 108-10
 Monterey cypress, 94
 pathogens, 94-98, 101-7
 seiccardines, 105
 seiricuprolide, 105
 seiridins, 103-4
Seiridium cardinale, 95-96
Seiridium unicolor, 98
 virulence factors, 102-3
- Cysteine
 active defense mechanisms and, 70
N-acyl-homoserine lactones in plant-associated bacteria and, 211
- Cystine
 active defense mechanisms and, 69
- Cytoplasm
 root-knot nematode resistance genes in tomato and, 283, 287
- D**
- Datura stramonium*
 Xanthomonad diversity and, 43
- Deletion mutants
 satellite tobacco mosaic virus and, 309
- Delphacidae
Tenuiviruses and, 140, 142-44
- Development
 aflatoxin biosynthesis and, 343-44
 programmed cell death in plant disease and, 401-2
- DHDMST
 aflatoxin biosynthesis and, 340-41
- DHLI gene
Cochliobolus MAT gene and, 126
- DHOMST
 aflatoxin biosynthesis and, 341
- DHST
 aflatoxin biosynthesis and, 341
- Dibromochloropropane (DBCP)
 sustainable systems for nematode management and, 173
- Dicots
N-acyl-homoserine lactones in plant-associated bacteria and, 211
- Difenoconazole
 reduced tillage effect on soilborne plant pathogens and, 494
- Differential responses
 cypress canker and, 105-7
- Digitaria decumbens*
 sustainable systems for nematode management and, 187
- Dilatory resistance
 holistic plant health and, 8
- Diplodia* spp.
 cypress canker and, 94
- Diplogaster iberitieri*
 sustainable systems for nematode management and, 179
- Diplogasteritus* spp.
 sustainable systems for nematode management and, 182
- Direct-drill
 reduced tillage effect on soilborne plant pathogens and, 486
- Discolaimus silvicolus*
 sustainable systems for nematode management and, 179
- Discomycetes
Cochliobolus MAT gene and, 121
- Disease forecasting
 fire blight management and, 227-45
- Disease-loss data
 defensible
 holistic plant health and, 1
- Disease resistance
 programmed cell death in plant disease and, 393-410
 root border cells and, 323
 root-knot nematode resistance genes in tomato and, 277-89
- Disking
 reduced tillage effect on soilborne plant pathogens and, 487
- Dissemination
 cypress canker and, 107-8
- Diitylenchus africanus*
 sustainable systems for nematode management and, 190
- Diitylenchus dipsaci*
 sustainable systems for nematode management and, 184, 189, 192
- DMCI gene
Cochliobolus MAT gene and, 126
- DMST
 aflatoxin biosynthesis and, 340-41
- DNA-DNA hybridization
 Xanthomonad diversity and, 52-53
- DNA fingerprinting
 recombination in *Magnaporthe grisea* and, 249-70
 root-knot nematode resistance genes in tomato and, 286
- DNA probes
Magnaporthe grisea and, 252-53
- DNA:rRNA hybridization studies
 Xanthomonad diversity and, 43
- Doctor of plant health, 1-22
- Dolichochochodorus heterocephalus*
 sustainable systems for nematode management and, 186
- Domains
 active defense mechanisms and, 69, 71
- Dorylamids
 sustainable systems for nematode management and, 192
- Double-stranded DNA (dsRNA)
 satellite tobacco mosaic virus and, 301
- Double-stranded RNA (dsRNA)
Tenuiviruses and, 147-48
- Drechslera* spp.
Cochliobolus MAT gene and, 115
- Drosophila* spp.
 active defense mechanisms and, 70, 75
- E**
- Early Calwonder cultivar
 Xanthomonad diversity and, 45
- East Africa
 cypress canker and, 91, 96

- East Asia
 recombination in *Magnaporthe grisea* and, 249-70
- East Germany
 former
 holistic plant health and, 8
- Echinochloa* spp.
 Tenuiviruses and, 140
- Ecologically-based pest management (EBPM)
 sustainable systems for
 nematode management and, 185
- Ecology
 N-acyl-homoserine lactones in
 plant-associated bacteria and, 219-20
 fire blight management and,
 227-45
 holistic plant health and, 7
 root border cells and,
 311-24
- Economics
 Tenuiviruses and, 140
- ECW cultigens
 pepper
 Xanthomonad diversity and,
 45
- Eds1* gene
 active defense mechanisms and,
 76
- Ehrlichia carotovora*
 active defense mechanisms and,
 67
- Ehrlichia chrysanthemi*
 active defense mechanisms and,
 67
- Ehrlichia stewartii*
 active defense mechanisms and,
 67
- Eleusine* spp.
 recombination in *Magnaporthe grisea* and, 250, 253-54, 256-57, 259-60, 263
- Elicitor proteins
 active defense mechanisms and,
 59-79
 root-knot nematode resistance
 genes in tomato and, 286
- Endophytes
 root cortical fungi and, 439-50
- Energy
 programmed cell death in plant
 disease and, 393-410
- England
 sustainable systems for
 nematode management
 and, 197
- Environmental factors
 fire blight management and,
 227
- Enzymes
 root cortical fungi and,
 445-46
- Epiphytic bacteria
 fire blight management and,
 227-45
- Eragrostis curvula*
 sustainable systems for
 nematode management
 and, 180, 187
- Erwinia amylovora*
 fire blight management and,
 227-45
- Erwinia carotovora*
 N-acyl-homoserine lactones in
 plant-associated bacteria
 and, 213-15
- Erwinia herbicola* strain
 C9-1
 fire blight management and,
 235-42
- Erwinia* spp.
 fire blight management and,
 231
 type III protein secretion
 systems and, 366
- Erwinia stewartii*
 N-acyl-homoserine lactones in
 plant-associated bacteria
 and, 215
- esa* genes
 N-acyl-homoserine lactones in
 plant-associated bacteria
 and, 215
- Esau, Katherine, 27-39
- Escherichia coli*
 active defense mechanisms and,
 64
- Ethylene
 systemic resistance induced by
 rhizosphere bacteria and,
 453, 474
- Ethylene dibromide (EDB)
 sustainable systems for
 nematode management
 and, 173
- etr1* gene
 systemic resistance induced by
 rhizosphere bacteria and,
 474-75
- Eukaryotic hosts
 N-acyl-homoserine lactones in
 plant-associated bacteria
 and, 207, 220
 type III protein secretion
 systems and, 363-83
- Europe
 cypress canker and, 95, 98
 holistic plant health and, 6
 recombination in *Magnaporthe grisea* and, 265-67
- sustainable systems for
 nematode management
 and, 197
- Xanthomonad diversity and, 46
- Eutettix tenella*
 history of research, 31
- Evolution
 Cochliobolus MAT gene and,
 117, 122-31
 holistic plant health and, 7
- exp* genes
 N-acyl-homoserine lactones in
 plant-associated bacteria
 and, 213-14
- Exploitation competition
 root cortical fungi and, 440
- Exserohilum* spp.
 Cochliobolus MAT gene and,
 115
- Ex situ gene banks
 holistic plant health and, 7
- Extracellular macromolecular
 structures
 type III protein secretion
 systems and, 380
- Extrachromosomal elements
 Cochliobolus MAT gene and,
 132
- Exudation
 root cortical fungi and, 447
- F**
- Factor B
 root border cells and, 316
- Farming
 reduced tillage effect on
 soilborne plant pathogens
 and, 485-97
- Fatty acids
 Xanthomonad diversity and,
 49-50
- Fen* gene
 active defense mechanisms and,
 68, 79
- Fertile Crescent
 Asian
 holistic plant health and, 6
- Fertility assays
 recombination in *Magnaporthe grisea* and, 249-70
- Field conditions
 systemic resistance induced by
 rhizosphere bacteria and,
 476-78
- Fire blight
 management of
 antagonist mixtures to
 enhance biocontrol,
 241-42

- biologically-based methods, 235-41
 blossom-blight phase, 228-29, 241-45
 floral surfaces as bacterial habitat, 230-33
 forecasting epiphytic growth, 233-35
 future research, 241-45
 infection risk, 233-35
 integration of biological and conventional control, 240-41
 introduction, 227-28
 new biologically-based models of disease suppression, 244-45
 orchard management practice effects on introduced and natural bacterial communities, 243-44
 population dynamics and suppression efficacy of bacterial antagonists in orchards, 236-40
 weather-based forecasting/changing technologies, 242-43
 Flagellar assembly machinery type III protein secretion systems and, 363, 366-68
 Flanking DNA
 Cochliobolus MAT gene and, 132
 Flaviviridae
 Tenuiviruses and, 158
 Flax
 active defense mechanisms and, 70, 79
 Flies
 Tenuiviruses and, 156
 Florida
 papaya ringspot virus and, 422-23
 Tenuiviruses and, 140
 Xanthomonad diversity and, 42, 46-47
 Flowers
 fire blight management and, 230-33
 FMRI gene
 Cochliobolus MAT gene and, 121
 Foliage pathogens
 sustainable systems for nematode management and, 165
 Foliar diseases
 reduced tillage effect on soilborne plant pathogens and, 488-89
 Food supply
 world
 holistic plant health and, 1
 Food webs
 sustainable systems for nematode management and, 165-98
 Foreign gene delivery
 satellite tobacco mosaic virus and, 308
 Forests
 cypress canker and, 91
 France
 root cortical fungi and, 442
 sustainable systems for nematode management and, 167
 French Guyana
 recombination in *Magnaporthe grisea* and, 259
 Fruiting bodies
 Cochliobolus MAT gene and, 131
 Fungi
 active defense mechanisms and, 60, 68-70, 72, 75
 Cochliobolus MAT gene and, 124-26
 cypress canker and, 91, 94-99, 100, 102
 holistic plant health and, 7-8, 19
 mating type gene technology and, 115-34
 root border cells and, 319-22
 sustainable systems for nematode management and, 176, 180
 systemic resistance induced by rhizosphere bacteria and, 453
 Fungicides
 reduced tillage effect on soilborne plant pathogens and, 493-95
 Fungi imperfecti
 recombination in *Magnaporthe grisea* and, 249-70
Fusarium avenaceum
 reduced tillage effect on soilborne plant pathogens and, 491
Fusarium graminearum
 reduced tillage effect on soilborne plant pathogens and, 489, 491
Fusarium oxysporum
 active defense mechanisms and, 70
Fusarium spp.
 Cochliobolus MAT gene and, 125
Fusarium udum
 sustainable systems for nematode management and, 180
 G
Gaeumannomyces graminis
 reduced tillage effect on soilborne plant pathogens and, 489-91
 Gain-of-pathogenicity hypothesis
 Cochliobolus MAT gene and, 133
 β -Galactosidase
 root border cells and, 318
 Gene flow
 recombination in *Magnaporthe grisea* and, 249-70
 Genetic diversity
 holistic plant health and, 1-22
 satellite tobacco mosaic virus and, 295-309
 Xanthomonad
 amylolytic activity, 47-48
 avirulence genes, 43-45
 bacteriocins, 50-51
 bacteriophages, 50-51
 carbon utilization, 49
 DNA-DNA hybridization, 52-53
 fatty acid analysis, 49-50
 genotypic variation, 51-54
 historical perspective, 42-43
 host-pathogen interactions, 43-45
 host range, 43-45
 phenotypic variation, 47-51
 protein profiles, 48-49
 races, 45-47
 repetitive elements, 51-52
 resistance genes, 43-45
 RFLP analysis, 51
 serology, 50-51
 variation, 53-54
 Genetic engineering
 programmed cell death in plant disease and, 393-410
 sustainable systems for nematode management and, 165, 168, 194-95
 Genetics
 active defense mechanisms and, 59-80
 N-acyl-homoserine lactones in plant-associated bacteria and, 207-21
 aflatoxin biosynthesis and, 329-56

Cochliobolus MAT genes and, 115-34
 holistic plant health and, 6-8
 papaya ringspot virus and, 415-34
 programmed cell death in plant disease and, 393-410
 recombination in *Magnaporthe grisea* and, 249-70
 root border cells and, 311-24
 root-knot nematode resistance genes in tomato and, 277-89
 systemic resistance induced by rhizosphere bacteria and, 453-78
Tenuiviruses and, 139, 146-54
 type III protein secretion systems and, 363-83
 Xanthomonad diversity and, 41-54
 Genetic yield potential
 holistic plant health and, 1-22
 Genomic RNA
Tenuiviruses and, 139
 Georgia
 Xanthomonad diversity and, 46
Globodera pallida
 sustainable systems for nematode management and, 189
Globodera rostochiensis
 sustainable systems for nematode management and, 169, 186, 195
Globodera spp.
 sustainable systems for nematode management and, 169, 185, 189, 195
Glomerella cingulata
Cochliobolus MAT gene and, 131
Glomus fasciculatum
 sustainable systems for nematode management and, 180
Glomus spp.
 sustainable systems for nematode management and, 180
 β -Glucuronidase reporter gene
 active defense mechanisms and, 66, 77
 GPD gene
Cochliobolus MAT gene and, 116, 123-24, 132-33
 Gram-negative bacteria
N-acyl-homoserine lactones in plant-associated bacteria and, 207-21

Grasses
 recombination in *Magnaporthe grisea* and, 249-70
 Gray leaf spot of corn
 reduced tillage effect on soilborne plant pathogens and, 488
 Great Plains
 holistic plant health and, 6
 reduced tillage effect on soilborne plant pathogens and, 489, 492-93, 495
 Greece
 cypress canker and, 99
 root-knot nematode resistance genes in tomato and, 286
 Green Revolution
 holistic plant health and, 1
Gro1 gene
 root-knot nematode resistance genes in tomato and, 284
 Guadeloupe
 Xanthomonad diversity and, 46
Gymnosporangium juniperi
 holistic plant health and, 5

H

Haploidy
Cochliobolus MAT gene and, 129, 131
 Haplotypes
Cochliobolus MAT gene and, 123
 Harpin proteins
 active defense mechanisms and, 67
 type III protein secretion systems and, 374-75
 Hartig's net
 root cortical fungi and, 440
 Hawaii
 papaya ringspot virus and, 415-34
 Hawaii 7988 cultigen
 tomato
 Xanthomonad diversity and, 44
 Heat shock proteins
 root border cells and, 318
Helicotylenchus dihystra
 sustainable systems for nematode management and, 186, 192
Helminthosporium victoriae
 holistic plant health and, 6
 Helper virus specificity
 satellite tobacco mosaic virus and, 295-309
Hesperis matronalis
 sustainable systems for nematode management and, 186
Heterodera avenae
 sustainable systems for nematode management and, 184-85, 189, 192, 195
Heterodera chajani
 sustainable systems for nematode management and, 180
Heterodera glycines
 sustainable systems for nematode management and, 169, 180, 183-84, 186, 188-91
Heterodera schachtii
 sustainable systems for nematode management and, 186-87, 195
Heterodera spp.
 sustainable systems for nematode management and, 169, 189, 195
Heterodera zeae
 sustainable systems for nematode management and, 186
 Heteroencapsulation
 papaya ringspot virus and, 429
 Heterogeneity
 satellite tobacco mosaic virus and, 303, 307
 Heterokaryons
 recombination in *Magnaporthe grisea* and, 254-56
 Heterothallic fungi
Cochliobolus MAT gene and, 124, 128-30, 134
 Hexanoic acid
 aflatoxin biosynthesis and, 336-37
 Hexaploidy
 holistic plant health and, 6
 Hexonyl CoA
 aflatoxin biosynthesis and, 337
 Himalayas
 recombination in *Magnaporthe grisea* and, 256-58, 260, 262-63, 267-69
 Histidine
 satellite tobacco mosaic virus and, 301
 HMG box
Cochliobolus MAT gene and, 121, 124, 132
 Holistic plant health
 history of research, 1-22

- Homeostasis
programmed cell death in plant disease and, 393-410
- Homoptera
Tenuiviruses and, 142
- Homothallic fungi
Cochliobolus MAT gene and, 122, 124, 126-31, 134
- Hoplotaimus columbus*
sustainable systems for nematode management and, 188, 190
- Hoplotaimus indicus*
sustainable systems for nematode management and, 186
- Hordeivirus* spp.
Tenuiviruses and, 153
- Hordeum vulgare*
Tenuiviruses and, 153
- Hordylemus europaeus*
sustainable systems for nematode management and, 179
- Host limitation
recombination in *Magnaporthe grisea* and, 256-58
- Host-pathogen interactions
Xanthomonad diversity and, 43-45
- Host range
satellite tobacco mosaic virus and, 297
Xanthomonad diversity and, 43-45
- Host resistance
reduced tillage effect on soilborne plant pathogens and, 495
sustainable systems for nematode management and, 165-98
holistic plant health and, 4, 7
- Host-specific recognition
root border cells and, 319-20
- HrpA protein
type III protein secretion systems and, 375-76
- hrp* genes
active defense mechanisms and, 65-67, 72, 74-75
N-acyl-homoserine lactones in plant-associated bacteria and, 218
type III protein secretion systems and, 373-77
Xanthomonad diversity and, 51, 80
- HsJ^{Pro-1}* gene
root-knot nematode resistance genes in tomato and, 284
- HSP70 protein
root border cells and, 318
- 5'-Hydroxyaverrantin
aflatoxin biosynthesis and, 339
- Hyoscyamus aureus*
Xanthomonad diversity and, 43
- Hyoscyamus niger*
Xanthomonad diversity and, 43
- Hypersensitive response
active defense mechanisms and, 59
programmed cell death in plant disease and, 393-410, 405-6
root-knot nematode resistance genes in tomato and, 279
- I**
- Idiomorphs
Cochliobolus MAT gene and, 117-21, 127-29
recombination in *Magnaporthe grisea* and, 260-62
- Illinois
holistic plant health and, 7
- Immune system
apoptosis and, 398
- India
Cochliobolus MAT gene and, 133
recombination in *Magnaporthe grisea* and, 256-60, 262-63, 265, 267-69
sustainable systems for nematode management and, 167
- Indiana
reduced tillage effect on soilborne plant pathogens and, 486
Xanthomonad diversity and, 46
- Indigofera hirsuta*
sustainable systems for nematode management and, 186
- Indonesia
recombination in *Magnaporthe grisea* and, 262
- Induced host resistance
sustainable systems for nematode management and, 165-98
- Induced resistance
root cortical fungi and, 439-50
- Induced systemic resistance
rhizosphere bacteria and, 453-78
- Influenza virus
Tenuiviruses and, 151
- Inhibitors
systemic resistance induced by rhizosphere bacteria and, 470-71
- Insects
sustainable systems for nematode management and, 183-84
- Integrated pest management (IPM)
holistic plant health and, 1-22
sustainable systems for nematode management and, 165, 169-70, 172-74, 185
- Intensive agroecosystems
sustainable systems for nematode management and, 167
- Interferon
active defense mechanisms and, 77
- Internal transcribed spacer
Cochliobolus MAT gene and, 116, 123-24, 132-33
- Inverse PCR
Cochliobolus MAT gene and, 121
- Iowa
holistic plant health and, 5-9
sustainable systems for nematode management and, 191
- Iron
holistic plant health and, 19
- Isoflavone reductase
root border cells and, 318
- Israel
holistic plant health and, 7-9
- Italian cypress
cypress canker and, 92-94, 99
- Italy
root cortical fungi and, 442
- J**
- Jamaica
papaya ringspot virus and, 423, 432, 434
- Japan
cypress canker and, 98
recombination in *Magnaporthe grisea* and, 254, 262
root cortical fungi and, 442
Tenuiviruses and, 140, 143
- Jasmonic acid
systemic resistance induced by rhizosphere bacteria and, 453, 475

- Javesella dubia*
Tenuiviruses and, 141
Javesella obscura
Tenuiviruses and, 141
Javesella pellucida
Tenuiviruses and, 141
Juniperus spp.
 cypress canker and, 96-97

K

- Kansas
 reduced tillage effect on
 soilborne plant pathogens
 and, 486, 489, 492-93,
 495-96
 Kenya
 cypress canker and, 96
Klebsiella spp.
 fire blight management and, 231
 Knots
 active defense mechanisms and,
 69
 Korea
 recombination in *Magnaporthe*
grisea and, 256
Tenuiviruses and, 143
k-strategists
 sustainable systems for
 nematode management
 and, 182

L

- l2C-1* gene
 active defense mechanisms and,
 79
L6 resistance gene
 active defense mechanisms and,
 70, 76
 Lactones
N-acyl-homoserine, 207-21
 Lancelin soil
 root cortical fungi and, 444
Laodelphax striatellus
Tenuiviruses and, 141, 143, 145
Lathyrus spp.
 sustainable systems for
 nematode management
 and, 186
 Latin America
Tenuiviruses and, 140
 Legumes
 holistic plant health and, 5
 satellite tobacco mosaic virus
 and, 307
 sustainable systems for
 nematode management
 and, 180

- Leptotyphlops cupressi*
 cypress canker and, 91,
 96-100
Leptosphaeria spp.
 cypress canker and, 95
 Lesion mimics
 programmed cell death in plant
 disease and, 393-410
 Leucine-rich repeat regions
 active defense mechanisms and,
 59, 63, 68-71, 74-75
 root-knot nematode resistance
 genes in tomato and, 277,
 282-85
 Leucine zipper motif
 active defense mechanisms and,
 76
 root-knot nematode resistance
 genes in tomato and,
 282-83
Leuconostoc mesenteroides
 sustainable systems for
 nematode management
 and, 179
Limonomycetes roseipellis
 reduced tillage effect on
 soilborne plant pathogens
 and, 494
 Lipopolysaccharide (LPS)
 systemic resistance induced by
 rhizosphere bacteria and,
 453, 465-66
Liriodendron tulipifera
 history of research, 36
LMi genes
 root-knot nematode resistance
 genes in tomato and, 285
 Loading
 rhizosphere
 root border cells and, 323
Longidorus caespiticola
 sustainable systems for
 nematode management
 and, 197
 Low-input sustainable agriculture
 (LISA)
 sustainable systems for
 nematode management
 and, 170
 L protein
Tenuiviruses and, 149
 Lux/LuxR system
N-acyl-homoserine lactones in
 plant-associated bacteria
 and, 207-21
Lycium chinense
 Xanthomonad diversity and, 43
Lycium halimifolium
 Xanthomonad diversity and, 43
Lycopersicon esculentum
 Xanthomonad diversity and, 43

- Lycopersicon peruvianum*
 root-knot nematode resistance
 genes in tomato and,
 277-89
Lycopersicon pimpinellifolium
 Xanthomonad diversity and, 43,
 45, 48
Lycopersicon spp.
 Xanthomonad diversity and,
 41-42, 44-54

M

- MAGGY retrotransposon
 recombination in *Magnaporthe*
grisea and, 253, 255,
 257-58, 260
 Magnoliaceae
 history of research, 36
Magnaporthe grisea
 active defense mechanisms and,
 70
 recombination in
 Americas, 265-67
 Asia, 267-68
 capacity for recombination,
 253-56
 distribution of fertility,
 262-64
 DNA probes, 252-53
 Europe, 265-67
 host limitation, 256-58
 impediments to sex, 258-60
 introduction, 249-51
 loss of sexual fertility,
 260-62
 mating assays, 252
 mating type, 262-63
 parasexual recombination,
 254-56
 phylogeny, 256-58
 population analysis, 264-68
 sexual fertility, 263-64
 sexual reproduction,
 253-54
 tools for recombination
 studies, 251-53
 Maize
 root border cells and, 313, 320
Tenuiviruses and, 139-40, 142,
 147, 150-57
 Major copies
Cochliobolus MAT gene and,
 132
 Major histocompatibility complex
 (MHC)
 active defense mechanisms and,
 79
 Major world crops
 holistic plant health and, 1

- Mantle
root border cells and, 321-22
- Marafivirus* spp.
Tenuiviruses and, 145
- MARYBLT system
fire blight management and, 234
- MAT gene locus
Cochliobolus spp. and, 115-34
recombination in *Magnaporthe grisea* and, 261-63
- Mating assays
recombination in *Magnaporthe grisea* and, 252
- Mating-type gene technology
fungal biology and, 115-34
recombination in *Magnaporthe grisea* and, 249-70
- Mauritius
Tenuiviruses and, 140
- Medicago truncatula*
root border cells and, 318
- Mediterranean region
cypress canker and, 91-111
- Meiosis
Cochliobolus MAT gene and, 126
recombination in *Magnaporthe grisea* and, 249, 259, 261
- Melampsora* spp.
holistic plant health and, 8
- Meloidogyne arenaria*
sustainable systems for nematode management and, 174, 186, 198
- Meloidogyne chitwoodi*
sustainable systems for nematode management and, 186, 188
- Meloidogyne hapla*
sustainable systems for nematode management and, 186
- Meloidogyne incognita*
sustainable systems for nematode management and, 179-81, 186, 188-89, 195
- Meloidogyne javanica*
sustainable systems for nematode management and, 186, 198
- Meloidogyne* spp.
root-knot nematode resistance genes in tomato and, 277-89
sustainable systems for nematode management and, 169, 174, 180, 183, 186-87, 189-90, 195, 197
- Messenger RNA (mRNA)
N-acyl-homoserine lactones in plant-associated bacteria and, 214
Cochliobolus MAT gene and, 120
root border cells and, 318
Tenuiviruses and, 139, 151-54
type III protein secretion systems and, 363
- Meu-1* gene
root-knot nematode resistance genes in tomato and, 282
- Mexico
papaya ringspot virus and, 423
Xanthomonad diversity and, 46-48
- MGR586
recombination in *Magnaporthe grisea* and, 253, 255-60, 264-68
- Mi gene
sustainable systems for nematode management and, 195
- Microbial ecology
fire blight and, 227-45
- Micrococcus* spp.
fire blight management and, 231
- Microorganisms
root border cells and, 311-24
sustainable systems for nematode management and, 183-84
- Mi gene
root-knot nematode resistance genes in tomato and, 277-89
- Millet
recombination in *Magnaporthe grisea* and, 249-70
- Minichromosomes
recombination in *Magnaporthe grisea* and, 258-59
- Minimum-till
reduced tillage effect on soilborne plant pathogens and, 486-87
- Minor copies
Cochliobolus MAT gene and, 132
- Moisture
reduced tillage effect on soilborne plant pathogens and, 491
root cortical fungi and, 446-47
- Moldboard plows
reduced tillage effect on soilborne plant pathogens and, 486-87, 496
- Molecular recognition events
eliciting primary defense responses
active defense mechanisms and, 61-76
- MON 4100 fungicide
reduced tillage effect on soilborne plant pathogens and, 493
- Monacrosporium ellipsosporum*
sustainable systems for nematode management and, 181
- Monochatia unicornis*
cypress canker and, 97
- Monoclonal antibodies
Xanthomonad diversity and, 41, 47-48, 50, 53
- Mononchidae
sustainable systems for nematode management and, 192
- Monophyletic clades
Cochliobolus MAT gene and, 132
- Monterey cypress
cypress canker and, 91, 94
- Morphology
holistic plant health and, 4
- M resistance gene
active defense mechanisms and, 70, 76
- Mucuna deeringiana*
sustainable systems for nematode management and, 188
- Multiline cultivars
holistic plant health and, 7-9
- Mutations
active defense mechanisms and, 65
satellite tobacco mosaic virus and, 295-309
type III protein secretion systems and, 363-83
Xanthomonad diversity and, 44, 45
- Mycosphaerella zeae-maydis*
Cochliobolus MAT gene and, 128-29
- Mycotoxins
programmed cell death in plant disease and, 403-5
- N**
- nahG* gene
systemic resistance induced by rhizosphere bacteria and, 454, 473-74

- Natural variability
genomic
satellite tobacco mosaic virus
and, 301-5
- NDRI* gene
active defense mechanisms and,
76
- Nebraska
holistic plant health and, 15
- Necrosis
root border cells and, 321
satellite tobacco mosaic virus
and, 306, 309
- Necrotrophic phase
root border cells and, 321
- Negative-sense genomic RNA
Tenuiviruses and, 139
- Nematodes
active defense mechanisms and,
60, 70-71, 75
root-knot resistance genes and,
277-89
sustainable systems for
management of
advisory programs,
195-96
bioindicators of ecosystem
health, 182-83
designing ecology- and
soil-based cropping
management systems,
184-93
food webs, 175-82
genetic engineering,
194-95
historical overview, 169-70
identification of nematodes,
194
insects, 183-84
integrated pest management,
172-74
introduction, 166-69
microorganisms, 183-84
new technologies, 193-96
nutrient cycling, 175-78, 181
population assessments of
nematodes, 194
precision agriculture,
193-94
soil biology, 174-93
strategies/tactics, 169-74
traditional host resistance,
194-95
weeds, 183-84
- Nematophthora gynophila*
sustainable systems for
nematode management
and, 181
- Nepal
recombination in *Magnaporthe*
grisea and, 262
- Netherlands
sustainable systems for
nematode management
and, 167
- Neurological system
apoptosis and, 398
- Neurospora africana*
Cochliobolus MAT gene and,
129
- Neurospora crassa*
Cochliobolus MAT gene and,
118, 121
- Neurospora* spp.
Cochliobolus MAT gene and,
117-18, 127, 129
- Neurospora tetrasperma*
Cochliobolus MAT gene and,
123
- New Zealand
cypress canker and, 95,
98-100
fire blight management and,
242
sustainable systems for
nematode management
and, 197
- Nicandra physalodes*
Xanthomonad diversity and,
43
- Niches
fire blight management and,
227
root border cells and,
311-24
root cortical fungi and,
440
- Nicotiana glauca*
satellite tobacco mosaic virus
and, 295-309
- Nicotiana glutinosa*
active defense mechanisms
and, 62
- Nicotiana rustica*
Xanthomonad diversity and,
43
- Nicotiana tabacum*
history of research, 33-34
- Nilaparvata lugens*
Tenuiviruses and, 141, 143
- Nitrogen
aflatoxin biosynthesis and,
349-51
holistic plant health and,
19
reduced tillage effect on
soilborne plant pathogens
and, 488, 495
- nodFEL* operon
N-acyl-homoserine lactones
N in plant-associated
bacteria and, 216, 219
- nod* gene
root border cells and, 319
- Noncapsid protein
Tenuiviruses and, 149, 151,
154-55
- Non-Mendelian transfer
mechanism
Cochliobolus MAT gene and,
134
- Nonsynonymous substitutions
amino acid
Cochliobolus MAT gene and,
122
- Noranthrone
aflatoxin biosynthesis and,
337-38
- Norsolorinic acid
aflatoxin biosynthesis and,
337-39
- North America
holistic plant health and, 6
recombination in *Magnaporthe*
grisea and, 265-67
sustainable systems for
nematode management
and, 197
- Xanthomonad diversity and,
46
- North Carolina
sustainable systems for
nematode management
and, 174, 190
- Xanthomonad diversity and,
46
- Northern corn leaf spot
Cochliobolus MAT gene and,
133
- No-till
reduced tillage effect on
soilborne plant pathogens
and, 485-88, 490, 496-97
- N protein
active defense mechanisms and,
63, 74
Tenuiviruses and, 144, 155, 157
- NR14 marker
root-knot nematode resistance
genes in tomato and, 287
- Nuclear magnetic resonance
(NMR)
active defense mechanisms and,
69
- Nucleotide-binding site
root-knot nematode resistance
genes in tomato and, 277,
282-83, 285
- Nucleotide comparisons
Cochliobolus MAT gene and,
122
- Nutrient cycling
root border cells and, 323

- root cortical fungi and, 445-46
- sustainable systems for nematode management and, 175-78, 181-82
- O**
- Oats
- Cochliobolus MAT* gene and, 133
- holistic plant health and, 5-7, 18-19
- OHHL
- N*-acyl-homoserine lactones in plant-associated bacteria and, 208, 210, 213-15, 218
- Ohio
- Xanthomonad diversity and, 46, 48
- Oklahoma
- Xanthomonad diversity and, 46
- Oligonucleotide primers
- Tenuiviruses* and, 152
- Xanthomonad diversity and, 51
- O-methyltransferase
- afatoxin biosynthesis and, 341
- OOHL
- N*-acyl-homoserine lactones in plant-associated bacteria and, 212-13
- Open reading frames (ORFs)
- Cochliobolus MAT* gene and, 118, 121
- satellite tobacco mosaic virus and, 300-1, 306, 309
- Tenuiviruses* and, 148-51, 154
- Orchards
- fire blight management and, 236-40, 243-44
- Oregon
- fire blight management and, 238
- Ornamental cypresses
- cypress canker and, 91, 94
- Oryza sativa*
- Tenuiviruses* and, 139-40
- Overwintering
- Tenuiviruses* and, 143
- Oxytetracycline
- fire blight management and, 237, 241
- P**
- Pacific Northwest
- fire blight management and, 236
- holistic plant health and, 8
- reduced tillage effect on soilborne plant pathogens and, 494
- Pacific Ocean
- cypress canker and, 95
- Paecilomyces lilacinus*
- sustainable systems for nematode management and, 181
- Pakistan
- sustainable systems for nematode management and, 167
- Pandemics
- cypress canker and, 91-111
- Panicum maximum*
- sustainable systems for nematode management and, 187
- Pantoea agglomerans*, EHC9-1
- fire blight management and, 235
- Pantoea* spp.
- fire blight management and, 231
- Papaya ringspot virus (PSRV)
- cross protection, 419-20
- Hawaii, 419-26
- introduction, 415
- large-scale field trial in devastated area, 425-28
- papaya fruit overview, 416
- papaya production, 418-19
- SunUp cultivar, 426-27
- transgenic papaya
- commercialization, 429-30
- deregulation, 428-29
- development, 421-23
- R0 plants of line 55-1, 424
- R1 plants of line 55-1, 423-24
- socioeconomic effect, 434
- transgenic field trial in Kapoho, 425-28
- UH Rainbow cultivar, 426-27
- viral overview, 416-18
- worldwide control, 430-34
- Parasexuality
- recombination in *Magnaporthe grisea* and, 249-70
- Parasite-derived resistance
- papaya ringspot virus and, 415-34
- Parasites
- root-knot nematode resistance genes in tomato and, 277-89
- sustainable systems for nematode management and, 176
- Paratrichodorus minor*
- sustainable systems for nematode management and, 186
- Paratylenchus* spp.
- sustainable systems for nematode management and, 182
- Particle structure
- viral
- satellite tobacco mosaic virus and, 295-309
- Paspalum notatum*
- sustainable systems for nematode management and, 187
- Pasteuria penetrans*
- sustainable systems for nematode management and, 181
- Pathogen-derived resistance
- papaya ringspot virus and, 415-34
- Pathogens
- active defense mechanisms and, 59-80
- Cochliobolus MAT* gene and, 59-80, 134
- cypress canker and, 91-111
- fire blight management and, 227-45
- recombination in *Magnaporthe grisea* and, 249-70
- reduced tillage effect on soilborne plant pathogens and, 485-97
- root cortical fungi and, 439-50
- sustainable systems for nematode management and, 165
- type III protein secretion systems and, 363-83
- Xanthomonad diversity and, 41-54
- Pathway-specific regulation
- afatoxin biosynthesis and, 341-43
- PCNB
- sustainable systems for nematode management and, 173
- Pea
- root border cells and, 316-17, 319
- Peanut
- holistic plant health and, 18
- sustainable systems for nematode management and, 170, 196
- Pear
- fire blight management and, 227-45
- Pectate
- Xanthomonad diversity and, 53

- Pectate lyase
N-acyl-homoserine lactones in
 plant-associated bacteria
 and, 213
- Pellioditis pellio*
 sustainable systems for
 nematode management
 and, 179
- Penicillium* spp.
Cochliobolus MAT gene and,
 125
- Pepper
 Xanthomonad diversity and,
 41–54
- Pepsis* spp.
 holistic plant health and, 3
- Peregrinus maidis*
Tenuiviruses and, 141, 143–44,
 154
- Perennials
 holistic plant health and, 8
- Peronospora parasitica*
 active defense mechanisms and,
 70, 76
- Peru
 recombination in *Magnaporthe*
grisea and, 254
- Petal expansion
 fire blight management and, 232
- pH
 aflatoxin biosynthesis and,
 351–53
 reduced tillage effect on
 soilborne plant pathogens
 and, 490
- Phenazine
N-acyl-homoserine lactones in
 plant-associated bacteria
 and, 217, 219–20
- Phenotype
 active defense mechanisms and,
 65
Cochliobolus MAT gene and,
 133
 root border cells and, 317
 systemic resistance induced by
 rhizosphere bacteria and,
 453
 Xanthomonad diversity and, 41,
 47–48, 51, 53–54
- Phenylalanine ammonia lyase
 root border cells and, 318
- Philippines
 recombination in *Magnaporthe*
grisea and, 262, 265,
 267–68
- Phlebotomids
Tenuiviruses and, 156
- Phlebovirus* spp.
Tenuiviruses and, 139–40, 149,
 157
- Phosphorus
 holistic plant health and, 19
 reduced tillage effect on
 soilborne plant pathogens
 and, 487
- Phylogeny
Cochliobolus MAT gene and,
 123–24, 133–34
 recombination in *Magnaporthe*
grisea and, 256–58
Tenuiviruses and, 155–56
 Xanthomonad diversity and,
 51
- Physalis minima*
 Xanthomonad diversity and,
 43
- Physiology
 aflatoxin biosynthesis and,
 329–56
- Phytoalexins
 systemic resistance induced by
 rhizosphere bacteria and,
 470–71
- Phytophthora vesicatoria*
 Xanthomonad diversity and,
 42
- PhzFABCD* operon
N-acyl-homoserine lactones in
 plant-associated bacteria
 and, 216–18
- Pili
 type III protein secretion
 systems and, 374–77
- Plantations
 cypress canker and, 91
- Plant cells
 active defense mechanisms and,
 61, 70–71
- Plant disease
 programmed cell death and,
 393–410
 reduced tillage effect on
 soilborne plant pathogens
 and, 485–97
 systemic resistance induced by
 rhizosphere bacteria and,
 455–65
- Plant doctors
 holistic plant health and, 1–22
- Plant health
 root border cells and, 311–24
- Planthopper vectors
Tenuiviruses and, 139–40,
 142–45, 151, 154–55,
 157–58
- Plasmids
 Xanthomonad diversity and,
 44–45
- Pleiotropy
 active defense mechanisms and,
 65
- Pleosporaceae
Cochliobolus MAT gene and,
 115, 121
- Pleospora* spp.
Cochliobolus MAT gene and,
 115
- Poaceae
Tenuiviruses and, 140
- Podospira anserina*
Cochliobolus MAT gene and,
 117–18, 121, 131
- Podospira* spp.
Cochliobolus MAT gene and,
 129
- Poland
 sustainable systems for
 nematode management
 and, 168
- Polygalacturonase
N-acyl-homoserine lactones in
 plant-associated bacteria
 and, 213
- Polymerase chain reaction (PCR)
Cochliobolus MAT gene and,
 121, 125, 132
 recombination in *Magnaporthe*
grisea and, 252, 262
 root-knot nematode resistance
 genes in tomato and,
 279–80, 287
 sustainable systems for
 nematode management
 and, 175
Tenuiviruses and, 152
 Xanthomonad diversity and, 50
- Polymorphisms
 recombination in *Magnaporthe*
grisea and, 249, 255–56,
 258–59, 264–65
 root-knot nematode resistance
 genes in tomato and, 280,
 286
- Pompiidae
 holistic plant health and, 3
- Population dynamics
 human
 holistic plant health and, 1,
 17
- plant
 fire blight management and,
 236–40
 recombination in
Magnaporthe *grisea* and,
 249–70
- Portugal
 cypress canker and, 98–99
- Potato
 holistic plant health and, 18
 root-knot nematode resistance
 genes in tomato and, 277,
 282–83, 287

- sustainable systems for
nematode management
and, 169, 172, 174, 179,
185, 189, 193, 195
- Powdery mildew
holistic plant health and, 8
- Pratylenchus brachyurus*
sustainable systems for
nematode management
and, 190
- Pratylenchus leiocephalus*
sustainable systems for
nematode management
and, 186
- Pratylenchus neglectus*
sustainable systems for
nematode management
and, 189
- Pratylenchus penetrans*
sustainable systems for
nematode management
and, 180, 186, 188
- Pratylenchus* spp.
sustainable systems for
nematode management
and, 186
- Precision agriculture
sustainable systems for
nematode management
and, 193-94
- Predators
sustainable systems for
nematode management
and, 176
- Prf* genes
active defense mechanisms and,
67-68, 75, 79
root-knot nematode resistance
genes in tomato and, 281
- Primary consumers
sustainable systems for
nematode management
and, 176
- Primary defense responses
active defense mechanisms and,
61, 63-76
- Programmed cell death
active defense mechanisms and,
59-60, 76-78, 80
in plant disease
animals, 395-98
biotechnology, 408-9
cell cycle, 399
ceramide signaling, 400-5
characteristics, 395-96
death-dependent changes,
397
evolution of research, 396
genes, 397
hypersensitive resistance
response, 405-6
introduction, 394-95
lesion mimic mutations,
406-8
mycotoxins, 403-5
plant development, 401-2
plant disease, 402-3
regulation and propagation
of apoptotic signal, 398-99
signaling pathways, 397
targeted therapies, 408-9
- Protection of indigenousness
holistic plant health and, 8
- Protein bands
Xanthomonad diversity and,
47-49, 53
- Protein kinases
active defense mechanisms and,
68, 75
- Protein-protein interactions
active defense mechanisms and,
59
- Pseudocercospora*
herpotrichoides
reduced tillage effect on
soilborne plant pathogens
and, 492
- Pseudoknots
satellite tobacco mosaic virus
and, 301
- Pseudomonas aureofaciens*
N-acyl-homoserine lactones in
plant-associated bacteria
and, 216-17
sustainable systems for
nematode management
and, 180
- Pseudomonas cepacia*
sustainable systems for
nematode management
and, 180
- Pseudomonas chlororaphis*
sustainable systems for
nematode management
and, 180
- Pseudomonas fluorescens*
active defense mechanisms and,
66
fire blight management and,
227, 235-42, 244
sustainable systems for
nematode management
and, 179
- Pseudomonas gladioli*
sustainable systems for
nematode management
and, 180
- Pseudomonas* spp.
fire blight management and, 231
systemic resistance induced by
rhizosphere bacteria and,
455, 457-72
- type III protein secretion
systems and, 366
- Pseudomonas syringae*
active defense mechanisms and,
63-66, 72, 74-75
sustainable systems for
nematode management
and, 189
- Pti transcriptional factors
active defense mechanisms and,
75
- Pto* gene
active defense mechanisms and,
68, 71, 75, 79
root-knot nematode resistance
genes in tomato and,
282
- Puccinia coronata*
holistic plant health and, 5-7
- Puccinia graminis*
holistic plant health and, 5-6
- Pulsed-field gel electrophoresis
Xanthomonad diversity and,
53
- Pyrenophora* spp.
Cochliobolus MAT gene and,
115, 132
- Pyrenophora tritici-repentis*
Cochliobolus MAT gene and,
122
reduced tillage effect on
soilborne plant pathogens
and, 489, 494
- Pythium* spp.
reduced tillage effect on
soilborne plant pathogens
and, 489, 491
- ## Q
- Quaternary structure
protein
active defense mechanisms
and, 59
- Quorum sensing
N-acyl-homoserine lactones in
plant-associated bacteria
and, 207-21
- ## R
- Races
Cochliobolus MAT gene and,
134
Xanthomonad diversity and,
41, 45-47
- Radish
systemic resistance induced by
rhizosphere bacteria and,
453

- Radopholus similis*
sustainable systems for
nematode management
and, 186, 189, 193
- Ralstonia solanacearum*
N-acyl-homoserine lactones in
plant-associated bacteria
and, 215
- Raspberry
sustainable systems for
nematode management
and, 180
- Rate-reducing resistance
holistic plant health and, 8
- rhoA* gene
active defense mechanisms and,
78
- rcpml* gene
root border cells and, 316
- Receptor proteins
active defense mechanisms and,
59
- Recombination
Magnaporthe grisea and,
249-70
suppression
Cochliobolus MAT gene and,
123
- Redox
aflatoxin biosynthesis and,
348-49
- Reduced tillage
soilborne pathogens and
biologicals for disease
control, 494
chemicals for disease
control, 493-94
cultural practices for disease
control, 495-97
foliar-affecting pathogens,
488-89
host resistance for disease
control, 495
importance, 485-88
protecting pathogen's refuge,
489-90
residue-borne pathogens,
492-97
root-affecting pathogens,
489-91
soil moisture, 491
soil temperature,
490-91
soil till, 491
wheat pathogens,
488-92
- Regulatory circuits
type III protein secretion
systems and, 381-82
- Reoviridae
Tenuiviruses and, 145
- Repetitive elements
Xanthomonad diversity and,
51-52
- Replacement series
sustainable systems for
nematode management
and, 183
- Replicases
satellite tobacco mosaic virus
and, 309
- Reporter genes
active defense mechanisms and,
72
- Residue-borne pathogens
reduced tillage effect on
soilborne plant pathogens
and, 492-97
- Resistance genes
active defense mechanisms and,
59, 69-70, 74, 77, 79-80
Xanthomonad diversity and,
43-45
- Restriction fragment length
polymorphisms (RFLPs)
recombination in *Magnaporthe*
grisea and, 255-56, 264
Xanthomonad diversity and, 51
- Retrotransposons
recombination in *Magnaporthe*
grisea and, 253, 255,
257-58, 260
- Reverse transcription PCR
Tenuiviruses and, 152
- rex* genes
N-acyl-homoserine lactones in
plant-associated bacteria
and, 214
root-knot nematode resistance
genes in tomato and, 279
- Rhabdoviridae*
Tenuiviruses and, 145
- Rhamnus palaestina*
holistic plant health and, 7
- rhiABC* operon
N-acyl-homoserine lactones in
plant-associated bacteria
and, 215-16
- Rhizobacteria
sustainable systems for
nematode management
and, 165, 174, 179-80,
197
Rhizobium-induced peroxidase
root border cells and, 318
Rhizobium leguminosarum
N-acyl-homoserine lactones in
plant-associated bacteria
and, 215-16
root border cells and, 319
Rhizobium meliloti
root border cells and, 318
- Rhizoctonia solani*
reduced tillage effect on
soilborne plant pathogens
and, 491
sustainable systems for
nematode management
and, 179
- Rhizoctonia* spp.
reduced tillage effect on
soilborne plant pathogens
and, 491
sustainable systems for
nematode management
and, 170
- Rhizosphere
N-acyl-homoserine lactones in
plant-associated bacteria
and, 217-19
root border cells and, 311-24
root cortical fungi and,
439-50
systemic resistance induced by
rhizosphere bacteria and,
453-78
- Rhynchosporium secalis*
active defense mechanisms and,
70
- Ribonucleoprotein particles
(RNPs)
circular
Tenuiviruses and, 139,
145-46, 151
Tenuiviruses and, 157
- Ribosomal DNA (rDNA)
Cochliobolus MAT gene and,
122
- Rice
Cochliobolus MAT gene and,
133
holistic plant health and, 18
recombination in *Magnaporthe*
grisea and, 249-70
Tenuiviruses and, 139-40, 142,
146-47, 150-51, 156-57
- Ridge-till
reduced tillage effect on
soilborne plant pathogens
and, 486
- Risk of infection
fire blight management and,
233-35
- RNAse protection assays
satellite tobacco mosaic virus
and, 302-5, 307-8
- Root-affecting pathogens
reduced tillage effect on
soilborne plant pathogens
and, 489-91
- Root border cells
rhizosphere and plant health
bioremediation, 323

- border cell separation, 316-17, 320-22
chemotaxis, 319-20
disease resistance, 323
functions, 320
future perspectives, 322-23
gene expression, 317-19
genetic engineering, 322-23
host-specific recognition, 319-20
introduction, 312
nutrition, 323
overview, 312-14
pathogen binding and growth, 319-20
regulation of border cell production, 314-16
rhizosphere dynamics, 322-23
rhizosphere loading, 323
signal transduction, 316-17
symbionts, 319-20
- Root caps**
root border cells and, 311-24
- Root cortical fungi**
biocontrol of root-rot with fungal antagonists and concepts, 441-42
defense in cortex, 442
effectiveness, 442-44
enzyme production, 445-46
field performance, 449
host range, 442-44
induced resistance, 447-48
introduction, 439-42
in vitro studies, 444-46
in vivo studies, 446-48
moisture, 446-47
nutrition, 445-46
origin, 442-44
protection mechanisms, 440-41
root colonization, 446
seed colonization, 447
soil effects, 448-49
sterile red fungus, 442-44
temperature, 444-47
thiamine, 447
- Root exudates**
biocontrol of root-rot with fungal antagonists and, 447
root border cells and, 311-24
- Root-knot resistance genes in tomato**
genome, 284-85
introduction, 277-78
Mi gene, 278-85
miscellaneous genes, 287-89
resistance properties, 278-80
specificity of resistance and nematode virulence, 285-87
structure, 282-84
- Root rot**
biocontrol of with fungal antagonists, 439-50
- Root tips**
root border cells and, 313
- Rostonia* spp.**
type III protein secretion systems and, 366
- Rotation**
with nonhosts
sustainable systems for nematode management and, 165
- Rotylenchulus reniformis***
sustainable systems for nematode management and, 186, 188
- Rotylenchulus* spp.**
sustainable systems for nematode management and, 189
- RPA analysis**
satellite tobacco mosaic virus and, 302-8
- Rpm* genes**
active defense mechanisms and, 67, 74, 76
root-knot nematode resistance genes in tomato and, 282
- RPP5* gene**
active defense mechanisms and, 76
- Rps* genes**
active defense mechanisms and, 67
root-knot nematode resistance genes in tomato and, 282
- Rpt* genes**
active defense mechanisms and, 76
- rsm* genes**
N-acyl-homoserine lactones in plant-associated bacteria and, 214
- r*-strategists**
sustainable systems for nematode management and, 182
- Russia**
recombination in *Magnaporthe grisea* and, 262
- Rust fungus**
holistic plant health and, 5-8, 19
- Rx genes**
Xanthomonad diversity and, 43-45
- S**
- Saccharomyces cerevisiae***
Cochliobolus MAT gene and, 117-118
- Salicylic acid**
systemic resistance induced by rhizosphere bacteria and, 453, 465, 467-69
- Salmonella* spp.**
active defense mechanisms and, 64-65
type III protein secretion systems and, 366, 378-80
- Sanitation**
sustainable systems for nematode management and, 165
- Saprophytes**
reduced tillage effect on soilborne plant pathogens and, 488
sustainable systems for nematode management and, 176
- Satellite tobacco mosaic virus (STMV)**
adaptation to tobamoviruses, 307-8
cross protection between minor variants of type strain, 304
distribution, 297
diversity between isolates, 304-5
diversity within type strain, 302-4
experimental genomic manipulation, 306
genome natural variability, 301-5
genome organization, 300-1
host plants, 297-98
host range, 297
introduction, 295-97
mutational analysis of infectivity and replication, 306
mutations inducing necrosis, 306-7
naturally occurring variants, 305
particle structure, 300-1
serial passage of type strain lines, 307
ultrastructure of infected cells, 298-99

- sbs* genes
N-acyl-homoserine lactones in plant-associated bacteria and, 216
- Schizosaccharomyces pombe*
Cochliobolus MAT gene and, 118, 120
- Sclerotinia trifoliorum*
Cochliobolus MAT gene and, 131
- Scotland
sustainable systems for nematode management and, 197
- Sec-independence
type III protein secretion systems and, 363
- Secondary consumers
sustainable systems for nematode management and, 176
- Secondary metabolism
aflatoxin biosynthesis and, 343-44
- Seeds
root cortical fungi and, 439
- Seiricardines
cypress canker and, 105
- Seiricuprolide
cypress canker and, 105
- Seiridins
cypress canker and, 103-4
- Seiridium cardinale*
cypress canker and, 91, 95-96
- Seiridium swartii*
cypress canker and, 100
- Seiridium unicorne*
cypress canker and, 91, 98
- Selfing
Cochliobolus MAT gene and, 123
- Separation
root border cells and, 316-17, 320-22
- Septoria tritici*
reduced tillage effect on soilborne plant pathogens and, 489
- Serial passage
of type strain lines
satellite tobacco mosaic virus and, 307
- Serine/threonine protein kinases
active defense mechanisms and, 68, 75
- Serology
Xanthomonad diversity and, 50-51
- Serratia* spp.
systemic resistance induced by rhizosphere bacteria and, 459, 462, 464, 468
- Sesamum indicum*
sustainable systems for nematode management and, 180
- Setaria* spp.
recombination in *Magnaporthe grisea* and, 250, 256, 258, 260, 263
- Setosphaeria rostrata*
Cochliobolus MAT gene and, 122
- Setosphaeria* spp.
Cochliobolus MAT gene and, 115, 132
- Sexual development
Cochliobolus MAT gene and, 115-34
- Sexual fertility
recombination in *Magnaporthe grisea* and, 249-70
- Shigella* spp.
active defense mechanisms and, 64
type III protein secretion systems and, 366, 378-80
- Siderophores
systemic resistance induced by rhizosphere bacteria and, 453, 466-67
- Signal transduction
N-acyl-homoserine lactones in plant-associated bacteria and, 211-19
programmed cell death in plant disease and, 393-410
root border cells and, 316-17
systemic resistance induced by rhizosphere bacteria and, 453
type III protein secretion systems and, 363, 372-73
- Silencing
gene
root-knot nematode resistance genes in tomato and, 285
- Silent substitutions
amino acid
Cochliobolus MAT gene and, 122
- Single-stranded RNA (ssRNA)
satellite tobacco mosaic virus and, 295-309
Tenuiviruses and, 147-48
- Smuts
holistic plant health and, 6
- Socioeconomic impact
papaya ringspot virus and, 415-34
- Sogatodes orizicola*
Tenuiviruses and, 141
- Soil biology/ecology
holistic plant health and, 19
reduced tillage effect on soilborne plant pathogens and, 490-91
root border cells and, 319
root cortical fungi and, 448-49
root-knot nematode resistance genes in tomato and, 277-78, 288
sustainable systems for nematode management and, 165, 174-93
- Solanaceae
Xanthomonad diversity and, 41-54
- Solanum dulcamara*
Xanthomonad diversity and, 43
- Solanum melongena*
Xanthomonad diversity and, 43
- Solanum nigrum*
Xanthomonad diversity and, 43
- Solanum rostratum*
Xanthomonad diversity and, 43
- Solanum tuberosum*
Xanthomonad diversity and, 43
- sol* genes
N-acyl-homoserine lactones in plant-associated bacteria and, 215
- Sordaria macrospora*
Cochliobolus MAT gene and, 129, 131
- Sorghum
holistic plant health and, 18
reduced tillage effect on soilborne plant pathogens and, 486
sustainable systems for nematode management and, 190
- South Africa
cypress canker and, 95, 99
Xanthomonad diversity and, 47
- South America
recombination in *Magnaporthe grisea* and, 265-67
Xanthomonad diversity and, 46
- South Asia
recombination in *Magnaporthe grisea* and, 249-70
- Sowing
root cortical fungi and, 439
- Soybean
active defense mechanisms and, 65

- holistic plant health and, 18
 reduced tillage effect on
 soilborne plant pathogens
 and, 486
 root border cells and, 315
 sustainable systems for
 nematode management
 and, 180, 184, 189–90, 195
- Spain
 sustainable systems for
 nematode management
 and, 192
- Sphaeropsis* spp.
 cypress canker and, 94
- Spherical viruses
 satellite tobacco mosaic virus
 and, 308
- Sri Lanka
 papaya ringspot virus and, 418
- SRV* gene
Cochliobolus MAT gene and,
 122
- Stagnospora nodorum*
 reduced tillage effect on
 soilborne plant pathogens
 and, 489
- Starch hydrolysis
Xanthomonas diversity and, 47,
 50, 53
- Stem loops
 satellite tobacco mosaic virus
 and, 301
- Stem rust
 holistic plant health and, 5–6
- Stemphilius* spp.
Cochliobolus MAT gene and,
 115
- Sterigmatocystin
 aflatoxin biosynthesis and,
 340–41
- Sterile red fungus
 biocontrol of root-rot and,
 439–50
- Sterility
 root cortical fungi and, 439–50
- Stigmatic surfaces
 fire blight management and,
 227–45
- Strawberry
 sustainable systems for
 nematode management
 and, 180
- Streptomycin
 fire blight management and,
 231–32, 241, 243–44
- Stress
 holistic plant health and, 11–20
- Sustenance agroecosystems
 sustainable systems for
 nematode management
 and, 167
- Subviral parasitism
 satellite tobacco mosaic virus
 and, 309
- Sugar beet
 active defense mechanisms and,
 71
 holistic plant health and, 18
 sustainable systems for
 nematode management
 and, 195
- Sustainable agriculture
 holistic plant health and,
 1–22
 nematode management and,
 165–98
- Sustainable yield
 holistic plant health and, 1
- Sward bean
 sustainable systems for
 nematode management
 and, 180
- Sweet potato
 holistic plant health and, 18
- Switching
Cochliobolus MAT gene and,
 126, 132
- Symbionts
N-acyl-homoserine lactones in
 plant-associated bacteria
 and, 207–21
 root border cells and, 319–20
- Systemic resistance
 rhizosphere bacteria-induced
Arabidopsis spp., 472–76
 criteria, 460–64
 field conditions, 476–78
 induced systemic resistance,
 456–78
 induction of resistance in
 plants, 453–78
 inhibitors, 470–71
 lipopolysaccharide, 465–66
 pathogenesis-related
 proteins, 469–70
 phytoalexins, 470–71
 plant-mediated disease
 suppression, 455–56
 salicylic acid, 467–69
 siderophores, 466–67
 structural alterations,
 471–72
 systemic acquired resistance,
 453–54
- T**
- Tagetes erecta*
 sustainable systems for
 nematode management
 and, 188
- Tagetes patula*
 sustainable systems for
 nematode management
 and, 180
- Tagetes* spp.
 sustainable systems for
 nematode management
 and, 188
- Tagosodes cubanus*
Tenuiviruses and, 141
- Tagosodes orizicola*
Tenuiviruses and, 141, 144, 155
- TAIL-PCR
Cochliobolus MAT gene and,
 121
- Taiwan
 papaya ringspot virus and,
 418–20, 432
- Take-all
 root cortical fungi and, 439–50
- Tapesia yallundae*
Cochliobolus MAT gene and,
 121
- Targeted therapies
 programmed cell death in plant
 disease and, 408–9
- Taxonomy
Cochliobolus MAT gene and,
 133
 holistic plant health and, 4
Tenuiviruses and, 140, 157
Xanthomonas diversity and, 41
- Technology transfer
 papaya ringspot virus and,
 415–34
- Temperature
 reduced tillage effect on
 soilborne plant pathogens
 and, 490–91
 root border cells and, 319
 root cortical fungi and, 444–47
 root-knot nematode resistance
 genes in tomato and, 277,
 279, 288
- Tenuivirus* genus
 viruses in
 characteristics, 145–56
 economic importance,
 140–42
 gene expression, 151–54
 genome organization,
 148–51
 genomic RNA, 146–48
 incidence, 140–42
 infections of plant and insect
 hosts, 154–55
 introduction, 139–42
 overview, 156–58
 phylogenetic relationships,
 155–56
 planthopper vectors, 142–45

- ribonucleoprotein particles, 145-46
virus-vector transmission interactions, 144-45
- Tertiary consumers
sustainable systems for nematode management and, 176
- Tertiary structure
protein
active defense mechanisms and, 59
- Tethron albovittatus*
Tenuiviruses and, 141
- Tetragonia* spp.
history of research, 35, 37
- Texas
holistic plant health and, 7-8
- Thailand
papaya ringspot virus and, 418, 420, 431-34
recombination in *Magnaporthe grisea* and, 262-63, 265
Xanthomonad diversity and, 46, 48
- Three-cultivar mixtures
holistic plant health and, 8-9
- Thiamine
root cortical fungi and, 447
- Thuja* spp.
cypress canker and, 96
- Tillage
soilborne pathogens and, 485-97
- Ti plasmid
N-acyl-homoserine lactones in plant-associated bacteria and, 211
- Tobacco
root-knot nematode resistance genes in tomato and, 281-82
satellite tobacco mosaic virus and, 295-309
sustainable systems for nematode management and, 168, 170, 174, 190
systemic resistance induced by rhizosphere bacteria and, 453
- Tobacco mosaic virus (TMV)
active defense mechanisms and, 61-63, 69, 74
- Tobamoviruses
helper
satellite tobacco mosaic virus and, 295-309
- TobRB7* gene
sustainable systems for nematode management and, 195
- Toll receptor
active defense mechanisms and, 75-76
- Tomato
canker
Xanthomonad diversity and, 41-54
races T1 and T2
Xanthomonad diversity and, 41, 45-47
root border cells and, 313
root-knot nematode resistance genes and, 277-89
sustainable systems for nematode management and, 168, 179, 181, 190
systemic resistance induced by rhizosphere bacteria and, 453
- Tospovirus* spp.
Tenuiviruses and, 145, 155-56
- Tox* genes
Cochliobolus MAT gene and, 133
- Traditional host resistance
sustainable systems for nematode management and, 194-95
- tra* genes
N-acyl-homoserine lactones in plant-associated bacteria and, 212-13, 216
- Transcription
N-acyl-homoserine lactones in plant-associated bacteria and, 207-21
Tenuiviruses and, 139
- Transcription factors
Cochliobolus MAT gene and, 115
- Transfer DNA (tDNA)
active defense mechanisms and, 67
- Transfer RNA (tRNA)
satellite tobacco mosaic virus and, 301
- Transformation
papaya ringspot virus and, 415-34
- Transgenes
Cochliobolus MAT gene and, 129, 131
papaya ringspot virus and, 415-34
root-knot nematode resistance genes in tomato and, 277-89
- Translocation
recombination in *Magnaporthe grisea* and, 258-59
- Transmission
Tenuiviruses and, 139, 144
- Tree tobacco
satellite tobacco mosaic virus and, 295-309
- Triadimenol
reduced tillage effect on soilborne plant pathogens and, 494
- Tripartite genomes
Tenuiviruses and, 155
- T-toxin
Cochliobolus MAT gene and, 133
- Tylenchorhynchus brassicae*
sustainable systems for nematode management and, 186
- Tylenchorhynchus mirzal*
sustainable systems for nematode management and, 186
- Tylenchulus* spp.
sustainable systems for nematode management and, 189, 192
- Type III protein secretion systems
Avr proteins, 376-77
bacterial invasion, 378-80
chaperones, 372-73, 378, 380
emerging model systems, 382
extracellular macromolecular structures, 380
flagellar assembly apparatus, 367-68
harpins, 374-75
HrpA protein, 375-76
hrp genes, 373-77
introduction, 363-64
pili, 374-77
plant pathogenic bacteria, 373-78
proteins associated with, 364-66
regulatory circuits, 381-82
Salmonella spp., 378-80
secreted proteins, 370-80
secretion signals, 372-73
Shigella spp., 378-80
unique problems, 377-78
Yersinia spp., 368-73
Ysc proteins, 370
- U
- Ultrastructure
satellite tobacco mosaic virus and, 298-99

- United Kingdom
holistic plant health and, 8
sustainable systems for
nematode management
and, 167
- United States
papaya ringspot virus and,
415-34
recombination in *Magnaporthe*
grisea and, 253-54, 266
reduced tillage effect on
soilborne plant pathogens
and, 485-86, 489,
492-96
root cortical fungi and, 442
root-knot nematode resistance
genes in tomato and, 286
sustainable systems for
nematode management
and, 167, 169, 173-74,
190-93, 195-96, 198
Tenuiviruses and, 140
Xanthomonad diversity and,
42, 46-48
- Unkanodes albifascia*
Tenuiviruses and, 141
- Unkanodes sapporana*
Tenuiviruses and, 141
- Untranslated regions (UTRs)
satellite tobacco mosaic virus
and, 300-2, 305, 308-9
- Ustilago avenae*
holistic plant health and, 6
- Ustilago kollerii*
holistic plant health and, 6
- V**
- Valley Fever
Cochliobolus MAT gene and,
126
- Variation
Xanthomonad diversity and,
53-54
- Variedad Colombia cultivar
holistic plant health and, 8
- V-blades
reduced tillage effect on
soilborne plant pathogens
and, 486-87
- Vectors
Tenuiviruses and, 139-40,
142-45, 151, 154-58
- Velvet bean
sustainable systems for
nematode management
and, 180
- Venezuela
papaya ringspot virus and,
434
- Versicolorinis A and B
aflatoxin biosynthesis and,
339-40
- Versiconal
aflatoxin biosynthesis and,
339
- Vertebrate-infecting viruses
Tenuiviruses and, 139
- Verticillium clamydosporium*
sustainable systems for
nematode management
and, 181
- Vesicular arbuscular mycorrhizal
(VAM) fungi
root border cells and, 319
sustainable systems for
nematode management
and, 180
- Vibrio fischeri*
N-acyl-homoserine lactones in
plant-associated bacteria
and, 207-21
- Vicia villosa*
sustainable systems for
nematode management
and, 180
- Victoria blight
Cochliobolus MAT gene and,
133
holistic plant health and, 6
- Vietnam
papaya ringspot virus and,
418
recombination in *Magnaporthe*
grisea and, 262
- Viral complementary RNA
(vcRNA)
Tenuiviruses and, 148-51
- Viral proteins
active defense mechanisms and,
61-63
- vir* genes
active defense mechanisms and,
65
- Virginia
sustainable systems for
nematode management
and, 196
- Virulence factors
Cochliobolus MAT gene and,
134
cypress canker and, 102-3
- Viruses
active defense mechanisms and,
60, 70, 76-77
apoptosis and, 398
satellite tobacco mosaic virus
and, 295-309
systemic resistance induced by
rhizosphere bacteria and,
453
- Tenuiviruses* and, 139-58
- W**
- Washington State
fire blight management and,
234
- Weather-based forecasting
fire blight management and,
242-43
- Weeds
sustainable systems for
nematode management
and, 183-84
- Western Australia
root cortical fungi and, 439,
441-42, 445
- Wheat
N-acyl-homoserine lactones in
plant-associated bacteria
and, 218
holistic plant health and, 5, 18,
21
reduced tillage effect on
soilborne plant pathogens
and, 486, 488-92
root-knot nematode resistance
genes in tomato and, 284
sustainable systems for
nematode management
and, 190, 195
- Wild-type strains
Cochliobolus MAT gene and,
120, 129
Xanthomonad diversity and, 44
- Wilsonema schuurmansstekhoveni*
sustainable systems for
nematode management
and, 183
- wts* genes
N-acyl-homoserine lactones in
plant-associated bacteria
and, 218
- X**
- Xa21* resistance gene
active defense mechanisms and,
68, 75, 79
- Xanthomonas axonopodis*
Xanthomonad diversity and, 43,
49, 52
- Xanthomonas campestris*
active defense mechanisms and,
65
pathogenicity on pepper and
tomato, 49-54, 72
- Xanthomonas gardneri*
pathogenicity on pepper and
tomato, 41-54

- Xanthomonas oryzae*
pathogenicity on pepper and
tomato, 72
- Xanthomonas* spp.
active defense mechanisms and,
63-64
type III protein secretion
systems and, 366
- Xanthomonas vesicatoria*
pathogenicity on pepper and
tomato, 41-54
- Xiphinema americanum*
sustainable systems for
nematode management
and, 186
- Xiphinema diversicadatum*
sustainable systems for

nematode management
and, 181, 197

- Xiphinema* index
sustainable systems for
nematode management
and, 189

Y

- Y chromosome
Cochliobolus MAT gene and,
117, 123
- Yeasts
Cochliobolus MAT gene and,
117-18, 120, 126
- Yersinia* spp.

active defense mechanisms and,
64-66

type III protein secretion
systems and, 366, 368-73

Ysc proteins
type III protein secretion
systems and, 370

Yugoslavia
former
Xanthomonad diversity and,
41, 48

Z

Zea mays
Tenuiviruses and, 139-40, 155



